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(54) **ORTHOTIC WALKER**

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(52) **U.S. Cl.** **280/87.021**; 280/87.041; 135/65; 135/67; 135/912
(58) **Field of Search** 135/66, 67, 65, 135/912; 280/87.021, 87.02, 87.05, 87.041; 297/5; 403/52, 53, 83, 84, 86, 91, 99, 119; 482/66, 69

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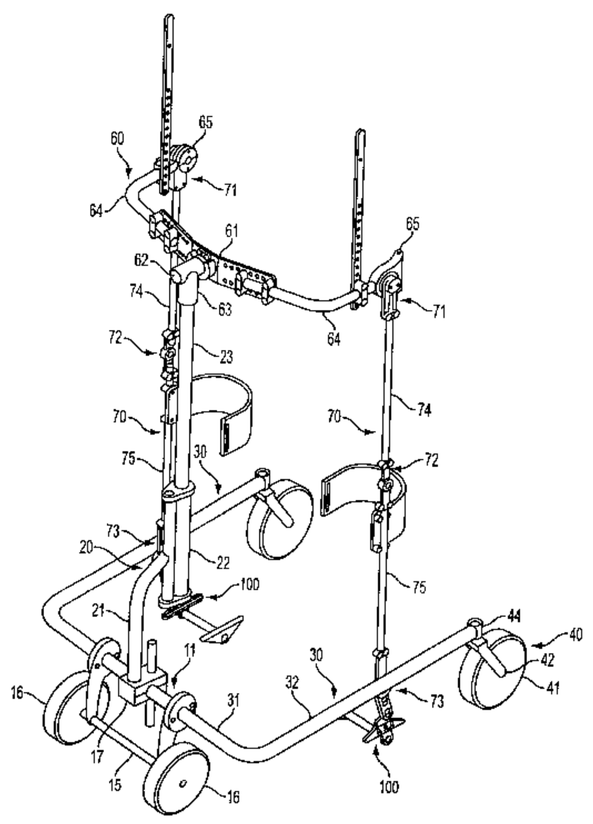
(57) **ABSTRACT**

An orthotic walker comprises an orthosis (**60**) mounted on a wheeled frame (**10**) which includes a first or rearward transverse frame member (**11**) having thereon an attachment device (**17**) for releasably mounting a support member (**20**) adapted to carry said orthosis (**60**) and a connection assembly (**13, 33**) for the releasable connection of forwardly extending lateral frame members (**30**) with an optional removable forward transverse frame member (**50**). The first frame member (**11**) carries a pair of laterally spaced wheels (**16**) and the lateral frame members (**30**) each carry a further wheel (**41**) at the forward end thereof. Several interchangeable lateral frame members (**30, 30**A) are provided whereby the overall width of the frame (**10**) can be varied by selecting lateral frame members (**32, 32**A) of differing size. The support member (**20**) which carries the orthosis (**60**) is one of a plurality of interchangeable support members (**20, 20**A) provided in a range of sizes to suit patients of differing height and weight. The orthosis (**60**) comprises a back member (**61**) carrying a pair of lateral arms (**64**) mounted adjustably thereon, and each said arm (**64**) includes a pivotal mounting (**65**) by means of which a respective leg support (**70**) is suspended. Each leg support includes an upper element (**74**) having a pivotal mounting (**71**) at its upper end whereby it is connected to a back support, a lower element (**75**) having a foot support member (**100**) at its lower end, and an intermediate pivotal connection (**72**) whereby the upper and lower elements are connected to one another, wherein the upper and lower elements (**74, 75**) of the leg supports (**70**) are releasably and adjustably secured to the upper pivotal mounting (**76**), to the intermediate pivotal connection (**72**) and to the foot support member (**100**), so that the effective length of each of said elements can be adjusted independently.

39 Claims, 11 Drawing Sheets



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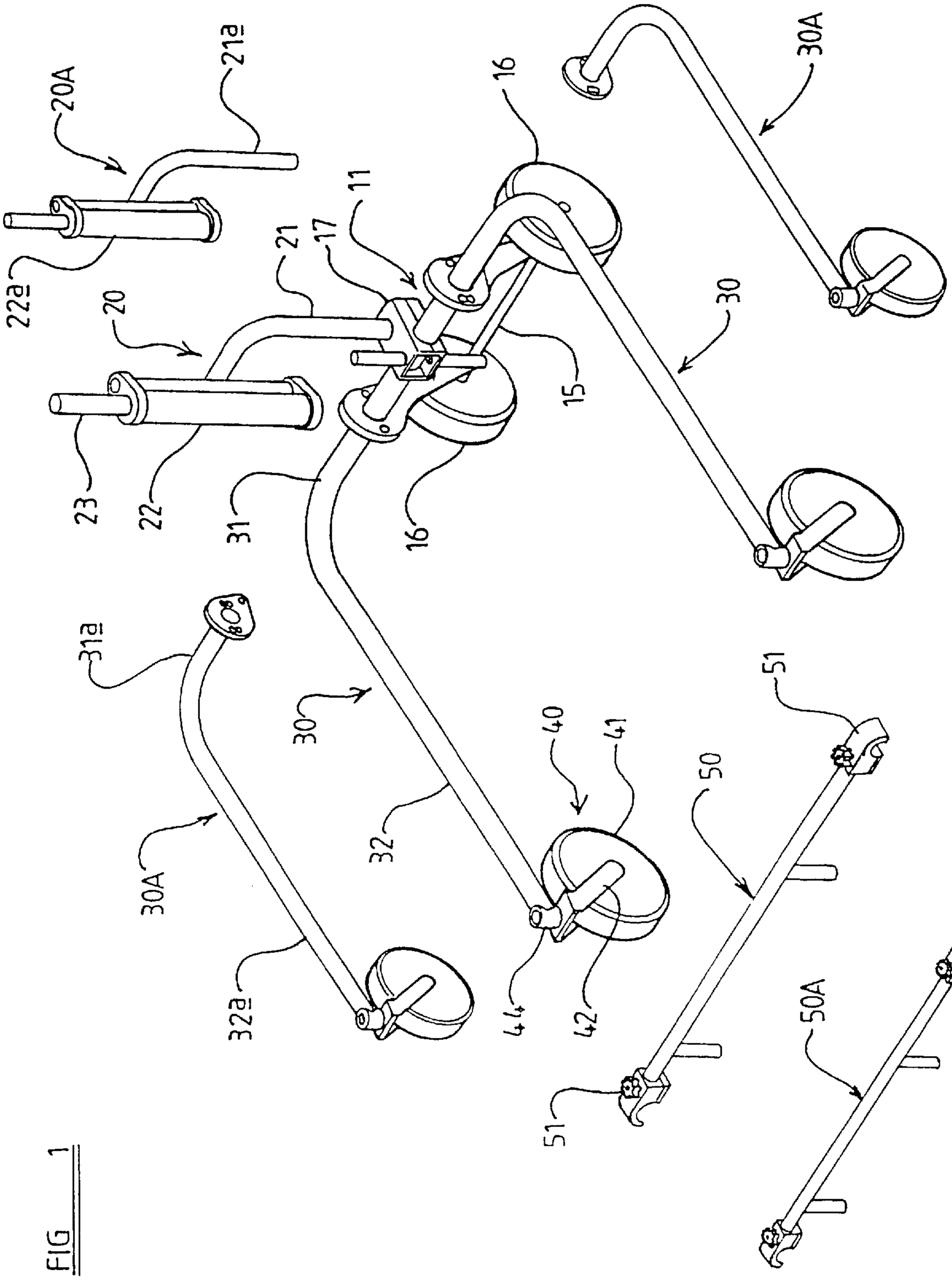
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FIG 1

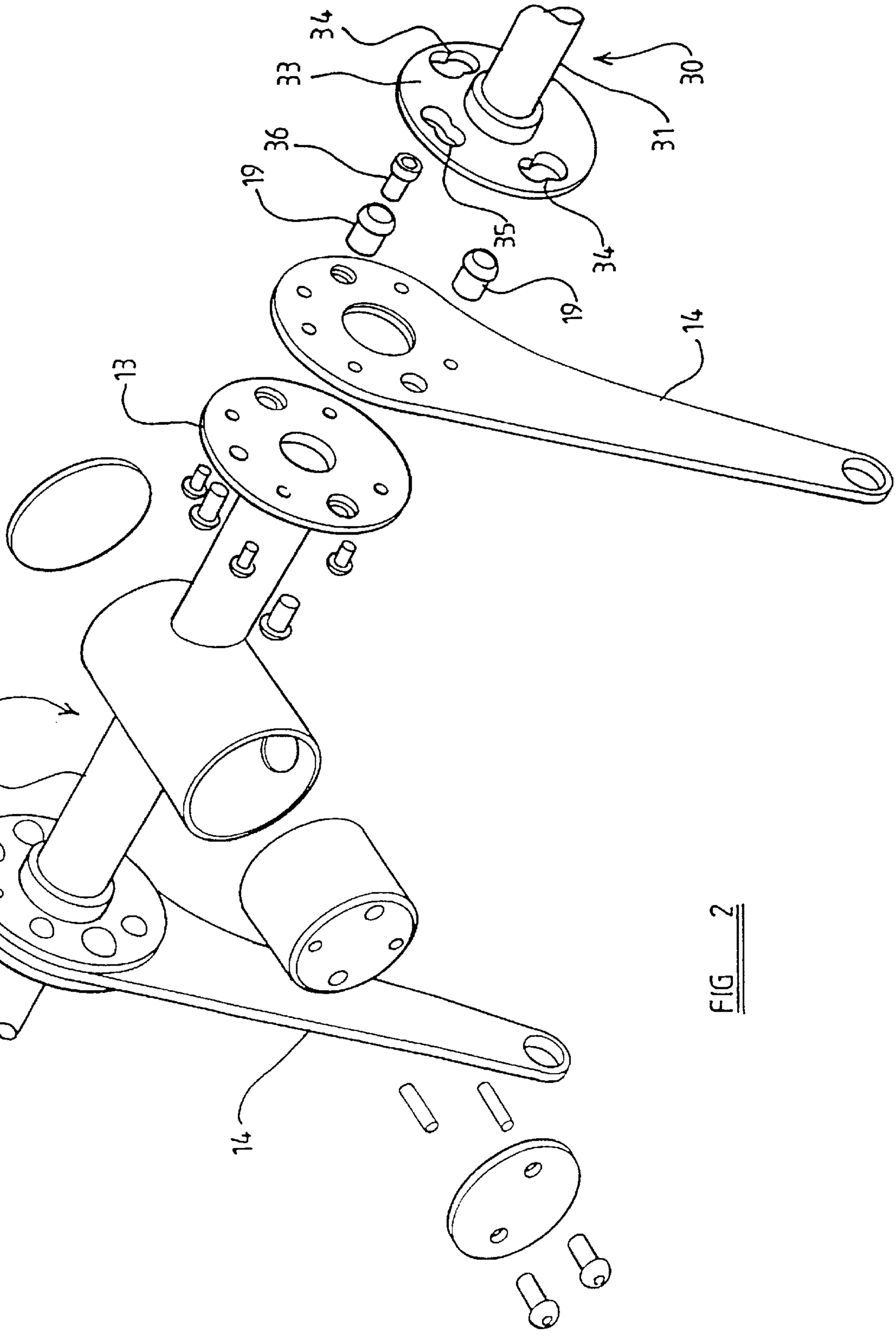


FIG 2

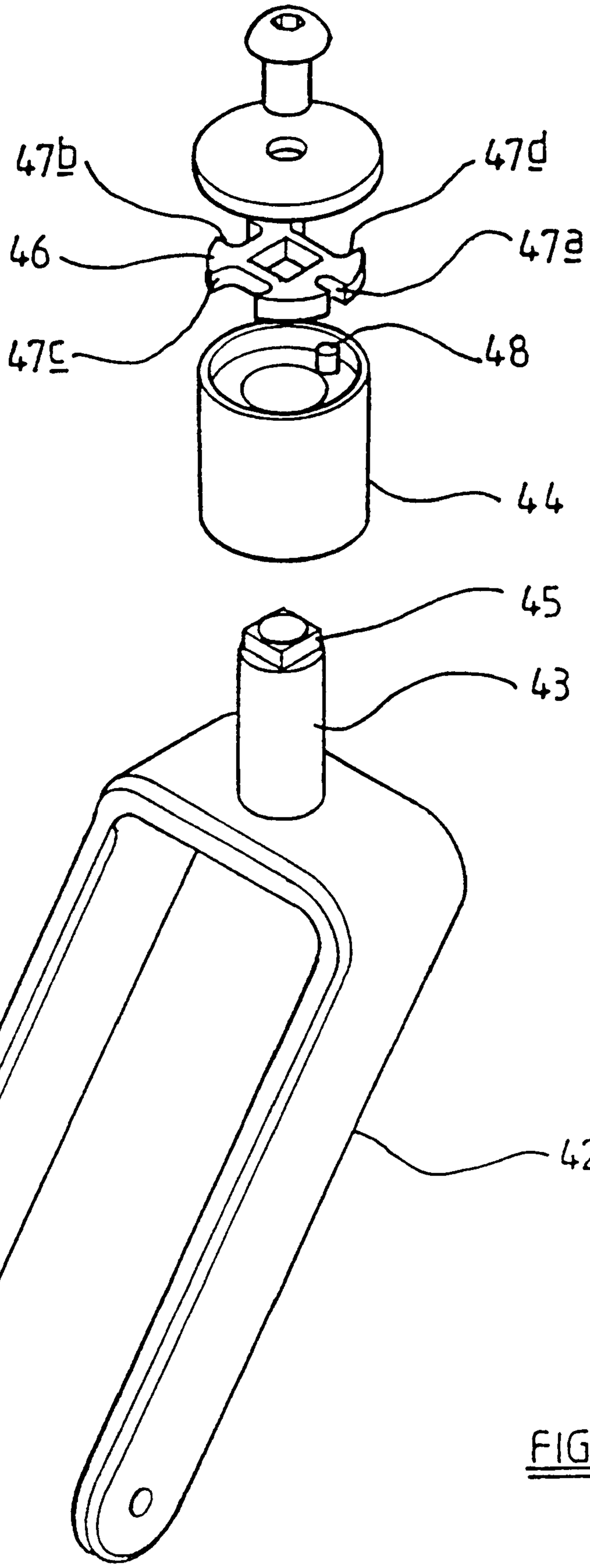
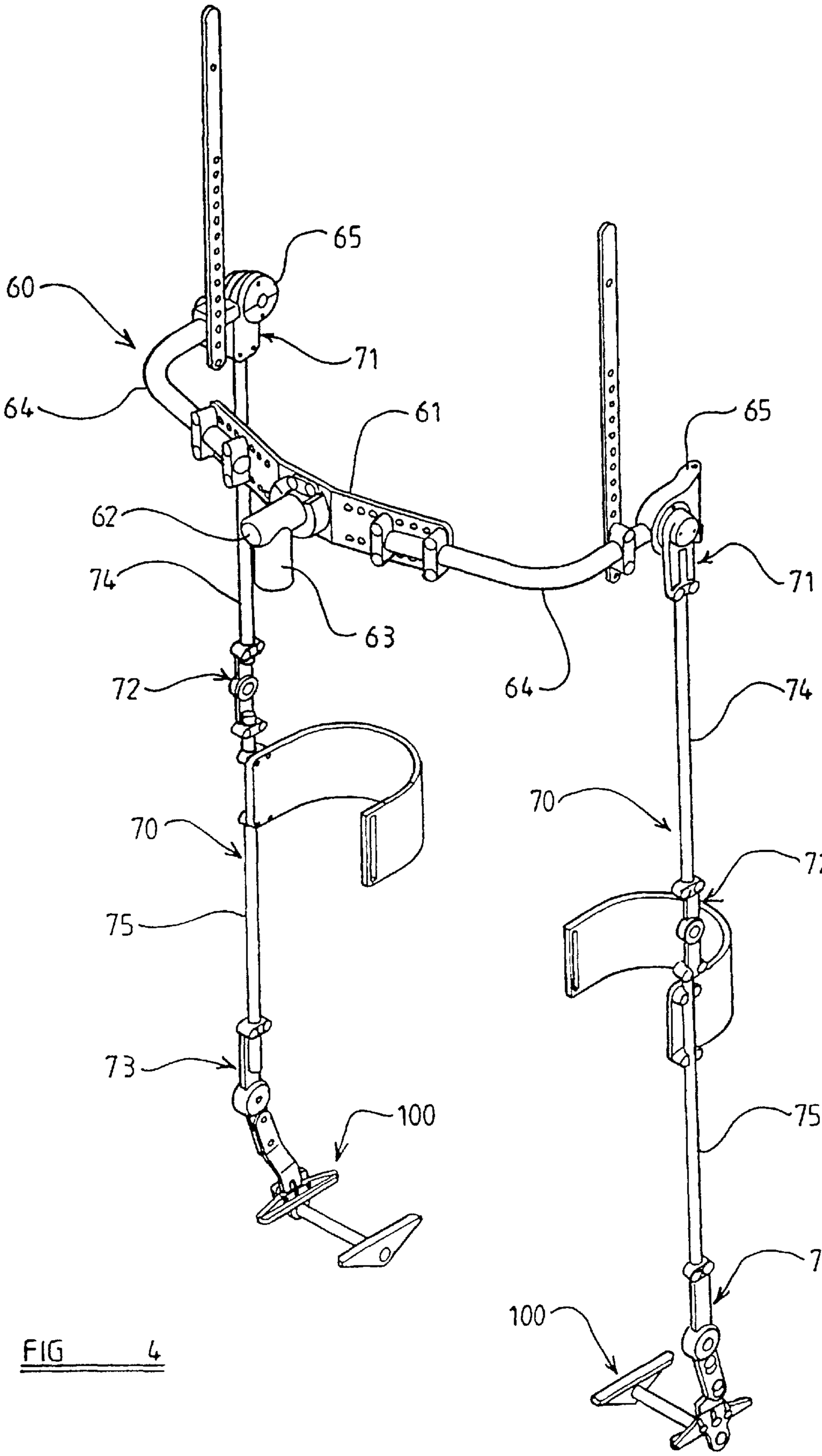


FIG 3



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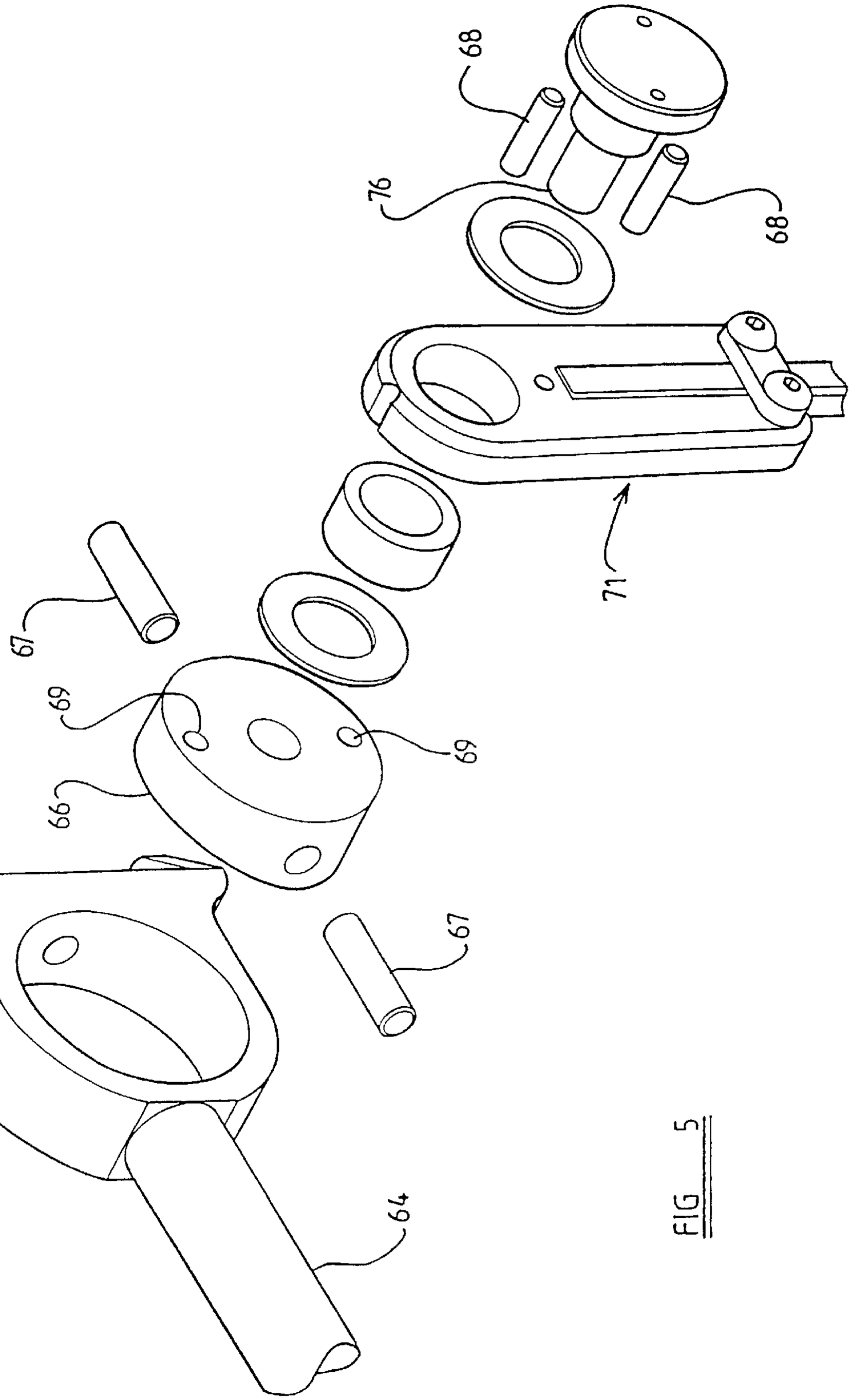
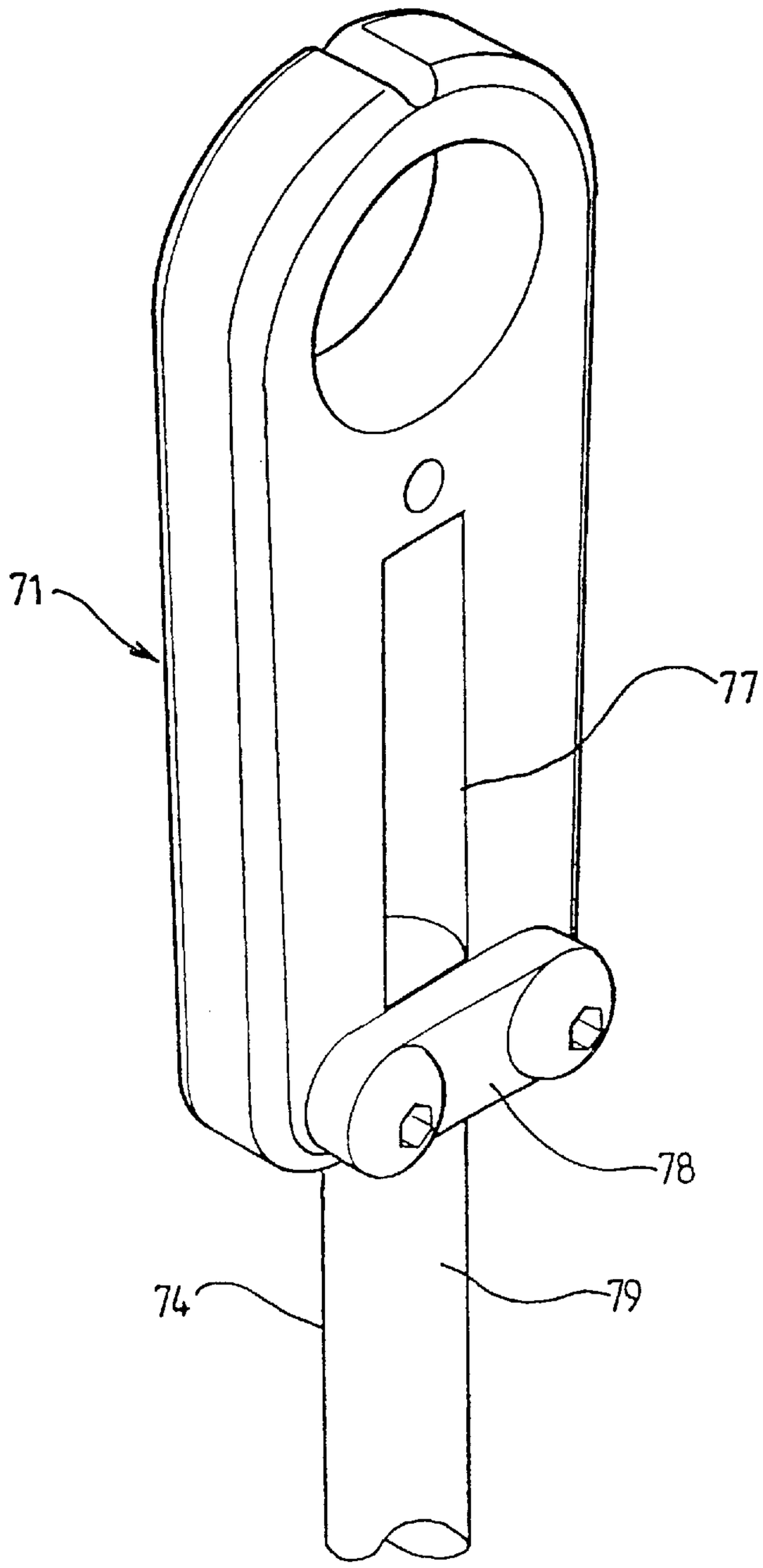


FIG 5



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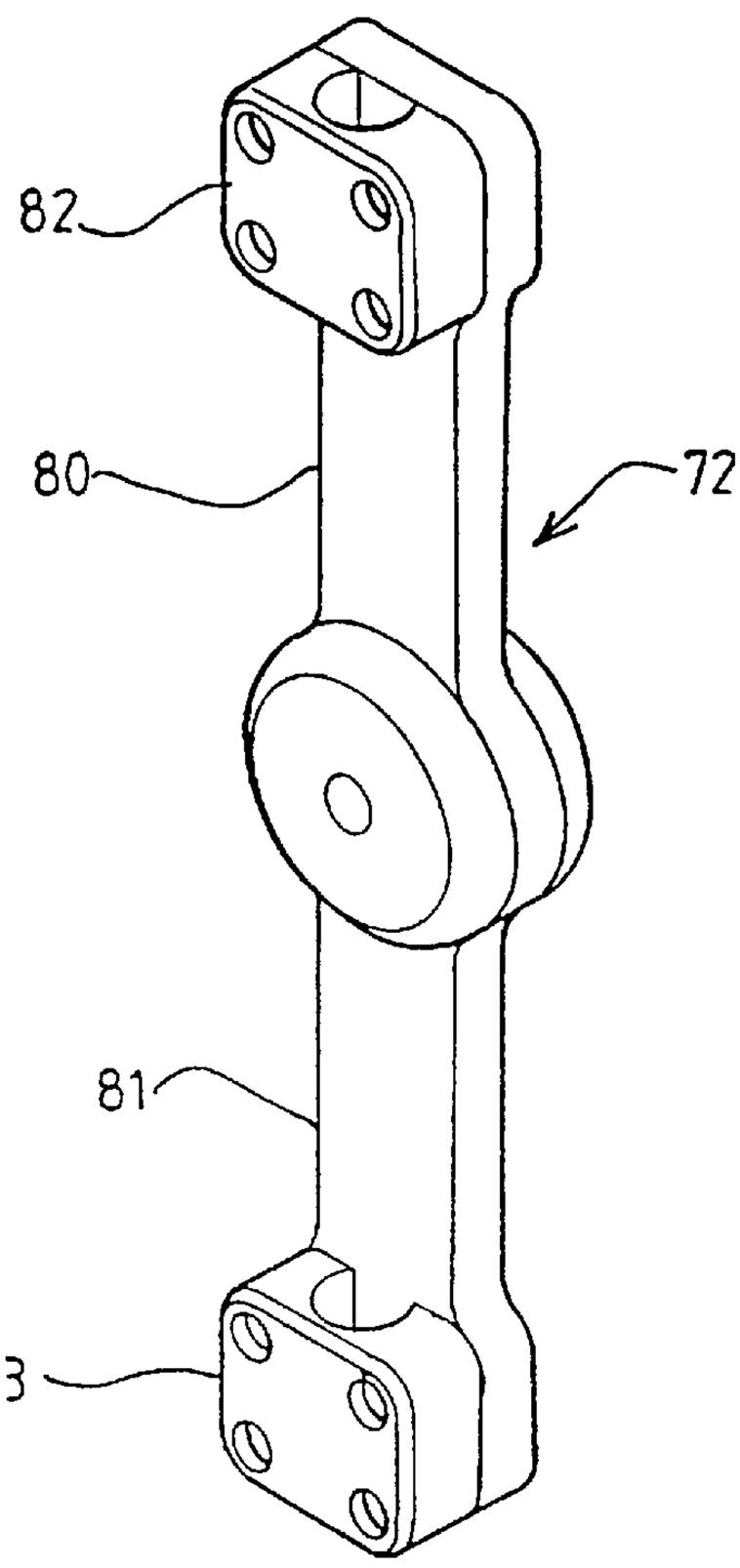

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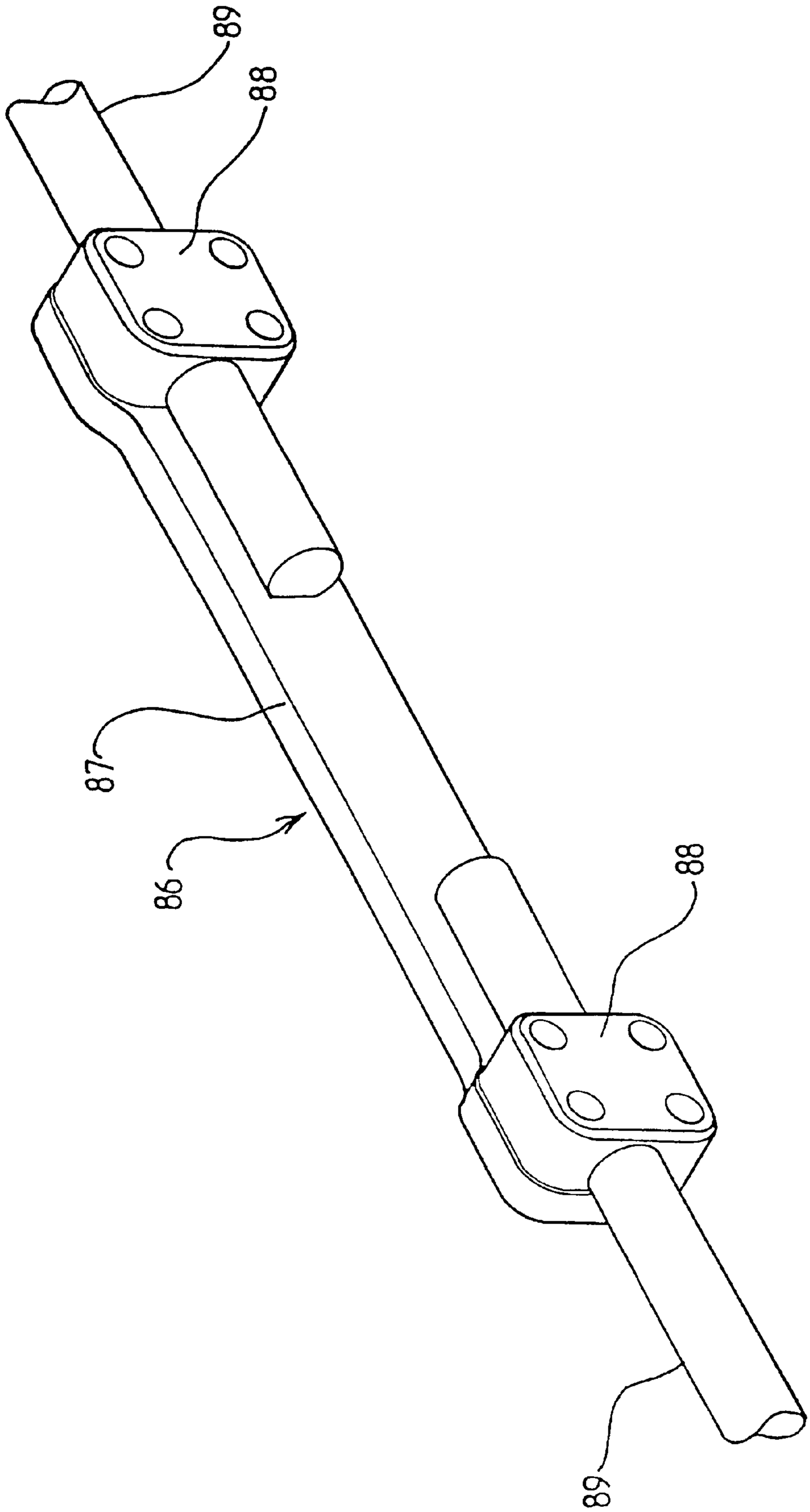


FIG 8

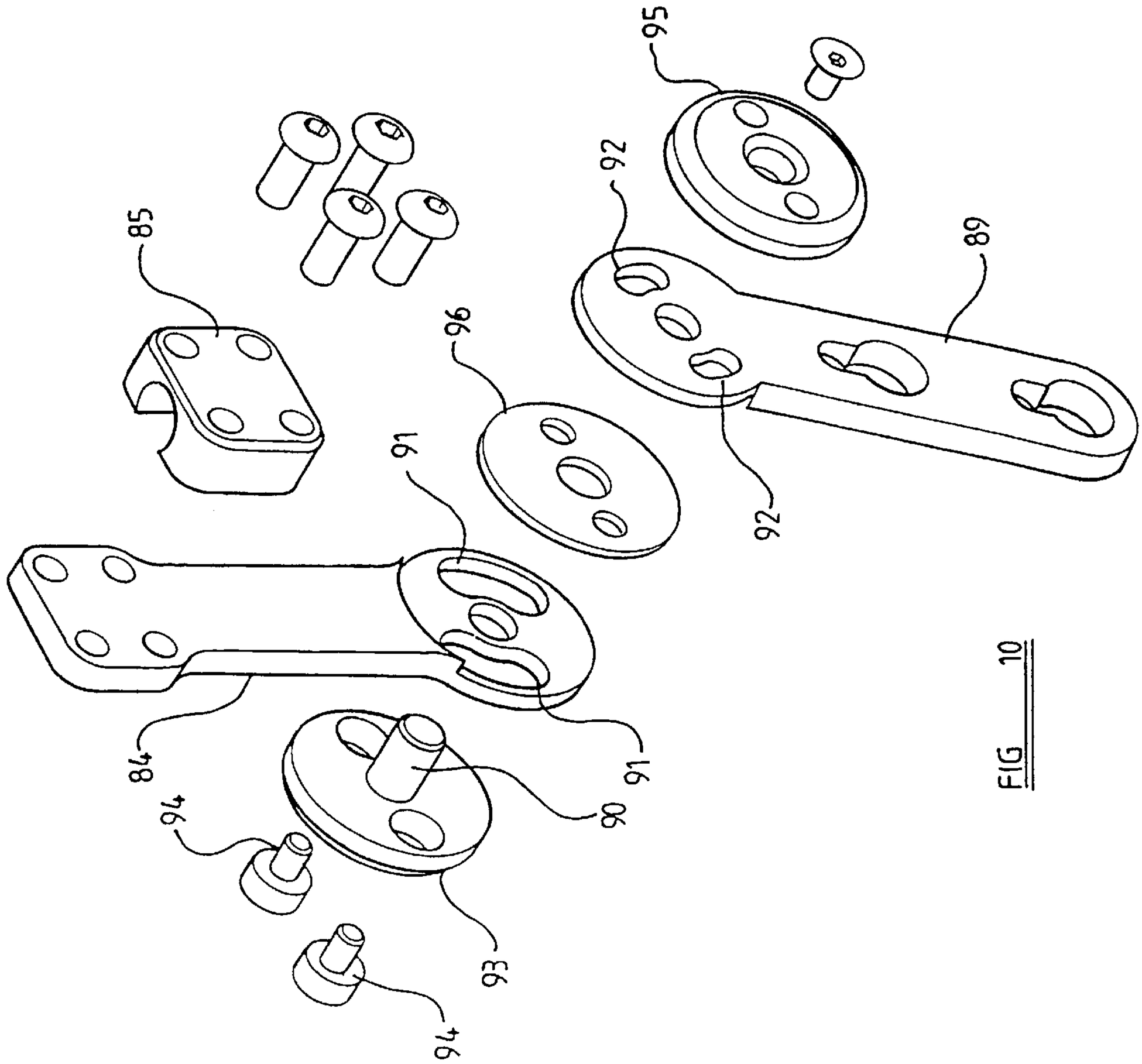
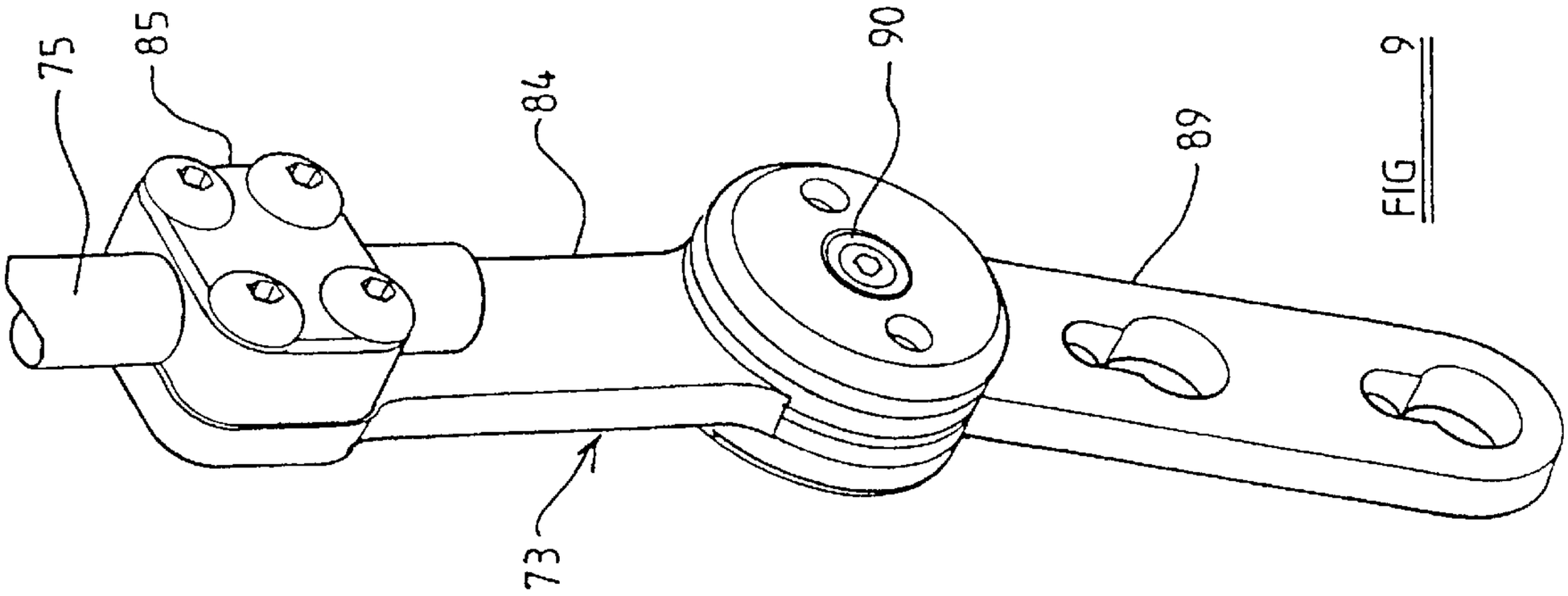


FIG 10



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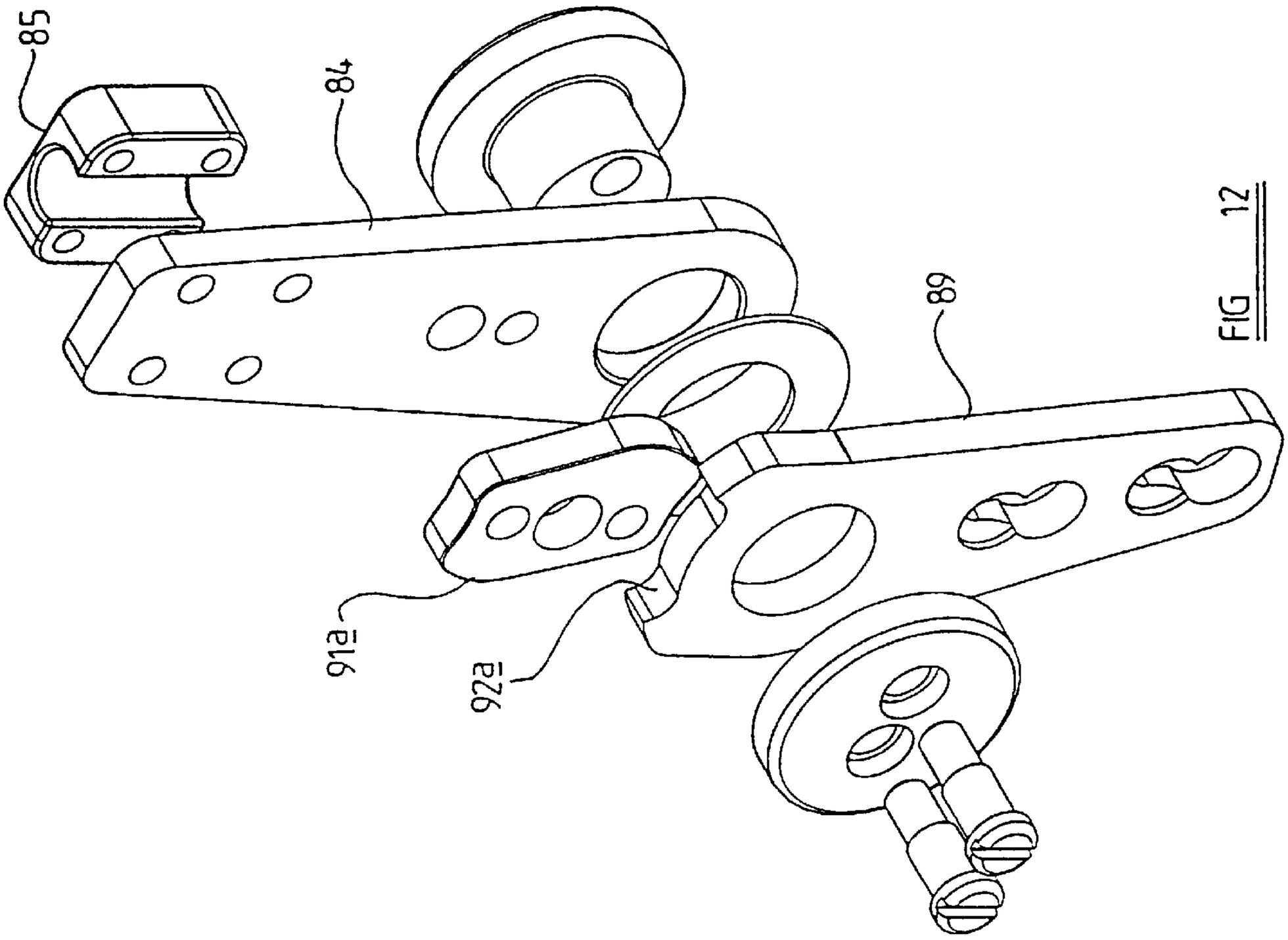
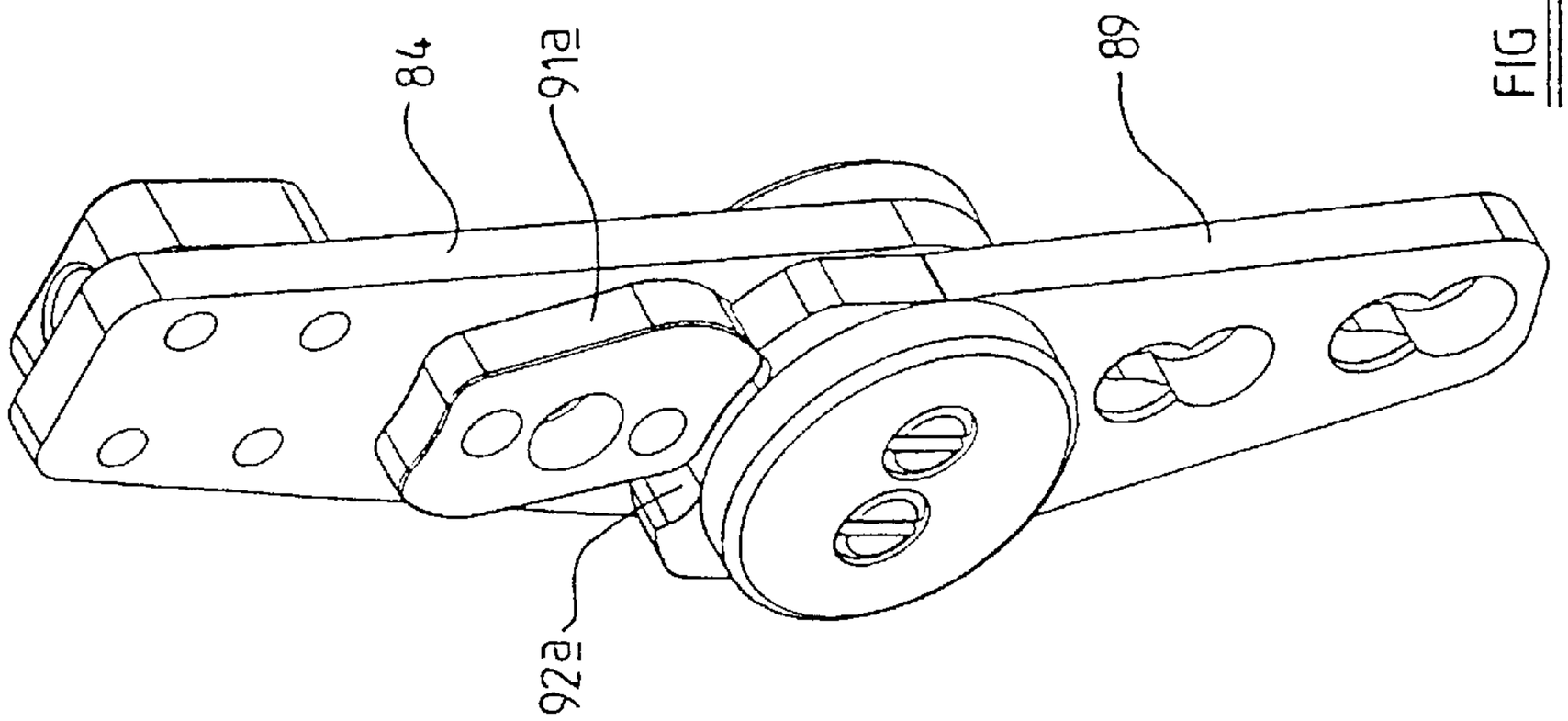


FIG 12



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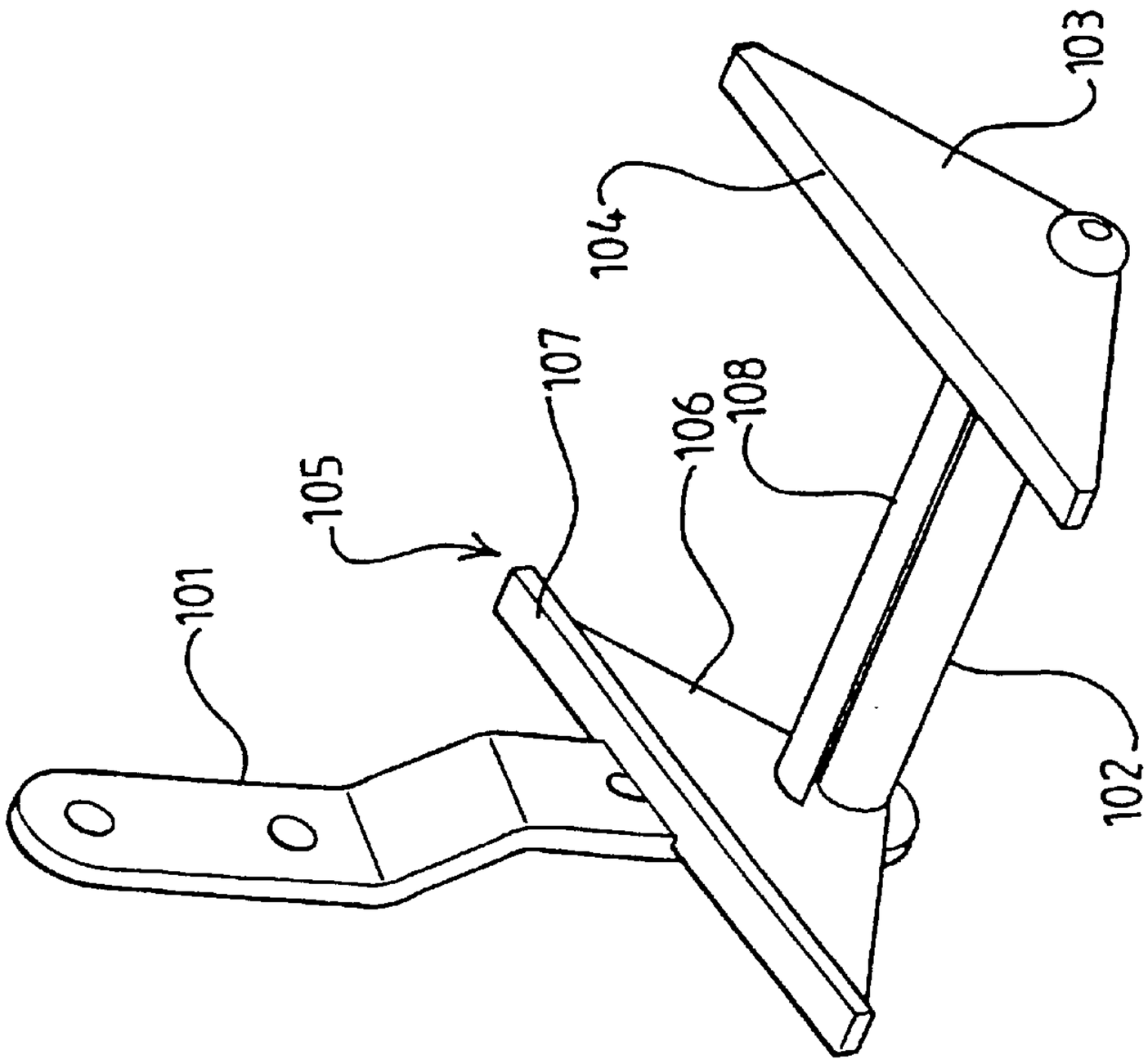

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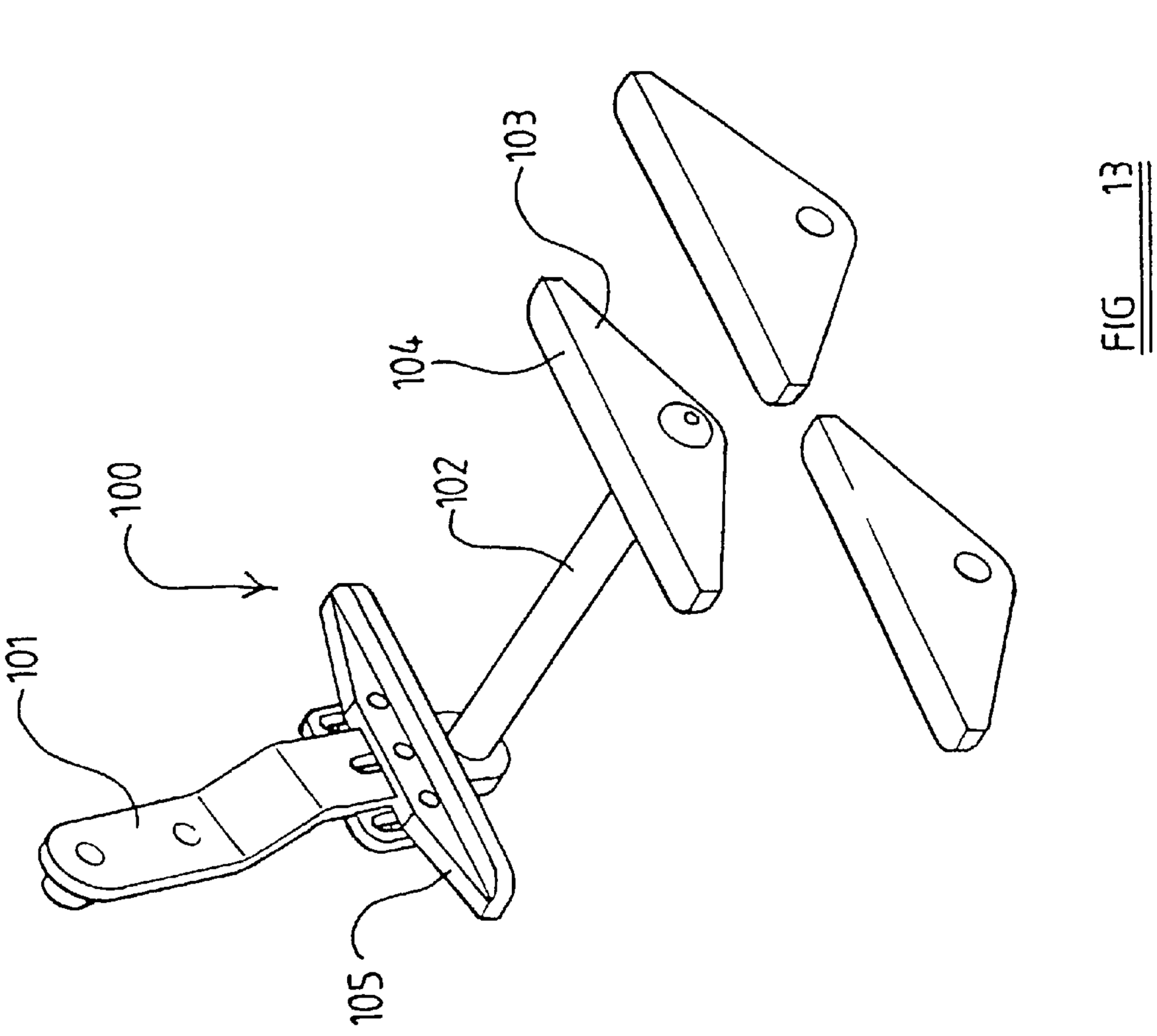

FIG 13

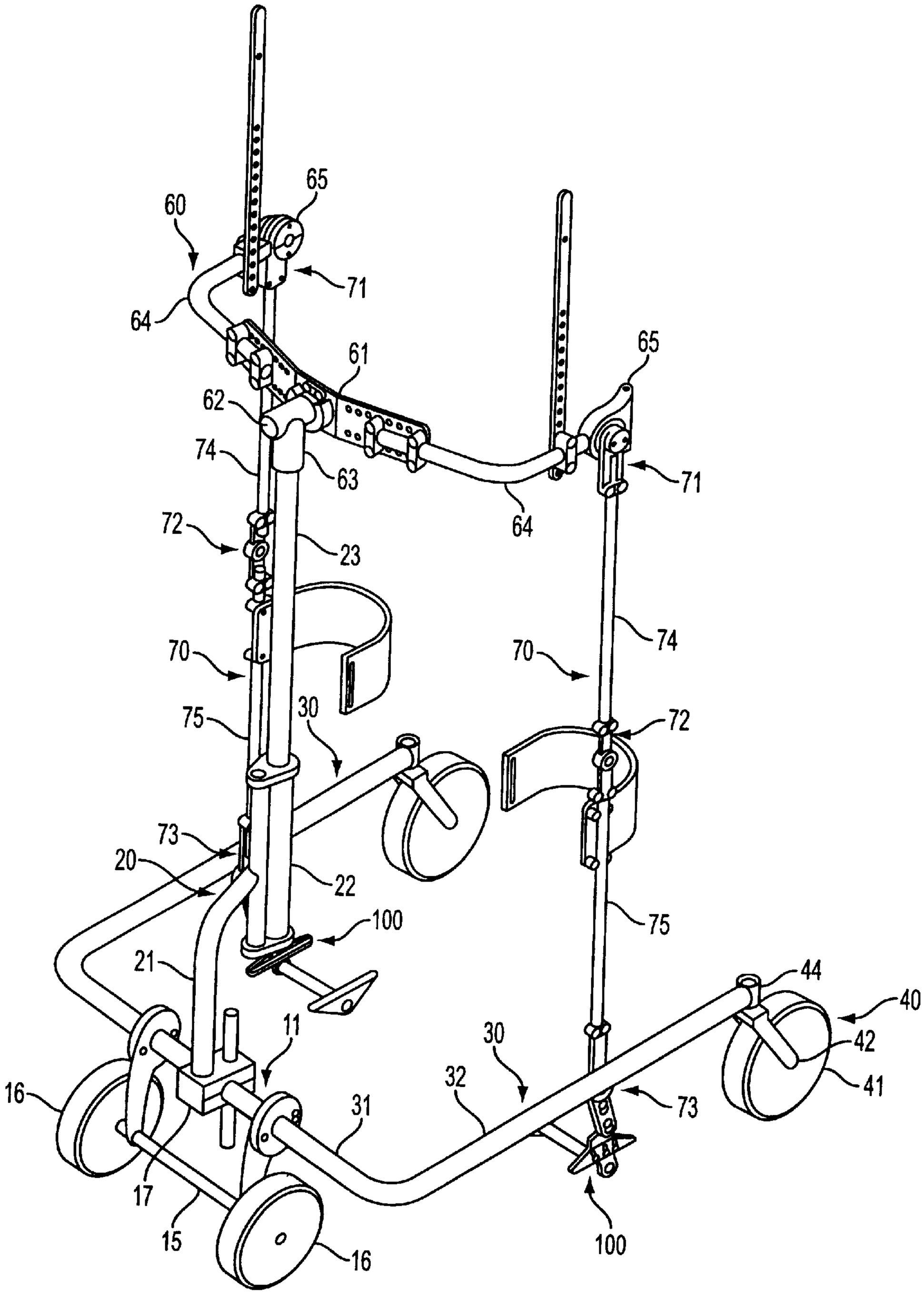
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FIG. 15

ORTHOTIC WALKER

BACKGROUND OF THE INVENTION

This invention relates to an orthotic walker, that is to say a device comprising an orthosis for supporting and controlling at least the legs, and optionally also the upper body, of a patient suffering from conditions such as cerebral palsy or other similarly debilitating conditions, and a wheeled frame on which the orthosis is mounted to provide support for the orthosis and the patient.

Existing orthotic walkers have various drawbacks and the object of the invention is to provide an improved orthotic walker having advantages as hereinafter explained.

SUMMARY OF THE INVENTION

Terms, such as "transverse," "lateral," "front" and "rear" as used herein are, unless the context requires otherwise, intended to indicate a direction relative to a normal walking direction of the device as in use.

According to a first feature of the invention, I provide an orthotic walker comprising an orthosis mounted on a wheeled frame, wherein the wheeled frame comprises a first frame member which extends generally in a direction transverse to the normal walking direction when in use and having thereon attachment means for releasably mounting a support member adapted to carry said orthosis and connection means for the releasable connection of lateral frame members at opposite ends of the first frame member.

The construction of the frame in this way enables different sizes of support member and of lateral frame members to be attached to the first frame member in order to adapt the walker for patients of differing height and/or weight or to adapt to the changing requirements of a growing patient.

In a preferred arrangement the first frame member carries a pair of laterally spaced wheels and said connection means are disposed outwardly thereof, and in this case the lateral frame members each carry a further wheel at or adjacent to the end thereof remote from said connection means.

Further wheels may be castor wheels adapted to swivel about an upright axis, whereas the wheels on or adjacent to the first frame member are preferably non-swivelling. Where such castor wheels are provided, preferably they include adjustable means for restricting the degree of swivelling allowed.

However, it would alternatively be possible for the lateral frame members to carry a respective wheel at or adjacent to the end thereof at which it is connected to the first frame member, in addition to, or instead of, the wheels carried by the first frame member.

The connection means for the lateral frame members conveniently comprises two or more headed studs which project in the transverse direction at each end of the first frame member at equal angular spacings about a transversely extending axis of rotation, and each of said lateral frame members includes a mounting plate having a number of key-hole slots corresponding to said studs, whereby wider end portions of said key-hole slots can be passed over the respective studs and the mounting plate rotated to engage said studs in narrower end portions of said slots.

The wheels carried by, or adjacent to, the first frame member are preferably carried at the outer ends of respective arms at positions spaced from the first frame member in a direction perpendicular to the transverse direction so that when the wheels are engaged with the floor to support the

walker a turning moment is applied to the arms, and the arrangement is such that the turning moment acts to assist retention of the studs in the narrower ends of the slots. However, a locking fastener may additionally be provided to hold the mounting plate in assembled relation with the first frame member.

The frame may additionally include a further transversely extending frame member which is releasably connectable to said lateral frame members at or near the ends thereof remote from their connection with said first frame member.

Normally the first frame member will define the rear part of the frame and the lateral frame members will extend forwardly therefrom with the further frame member connected at the forward ends thereof. The releasable connection of the further frame member at the forward side of the frame facilitates the location of the patient in the walker with this frame member removed and subsequently replaced.

In a preferred arrangement, each of the lateral frame members includes a transverse part whereby it is connected to the first frame member and a forwardly extending part. In this way the overall width of the frame can be varied by selecting lateral frame members having a transverse part of differing length.

Whilst it is particularly beneficial for the forward frame member to be releasable, it would alternatively be possible to utilise a single U-shaped frame member instead of separate lateral frame members with a removable forward transverse frame member.

The support member which carries the orthosis may be provided in a range of sizes to suit patients of differing height and weight, and preferably includes a linear suspension unit carried at the upper end of a generally upright arm. The suspension unit may comprise a rod guided for movement in a generally vertical direction under the control of a spring, and the orthosis may be releasably connectable to said rod.

The orthosis may comprise a back member having a mounting means thereon whereby it is releasably connectable to said rod of the suspension unit. The mounting means may be pivotally secured to said back member so as to allow the latter to tilt about a generally horizontal axis and may include a tubular fitting adapted to be engaged slidably over an end portion of said rod.

The back member may carry a pair of lateral arms mounted adjustably thereon, each arm including a transversely extending portion and a forwardly extending portion having a free end at which a respective leg support is pivotably suspended. Such leg supports each comprise an upper element having a pivotal mounting at its upper end whereby it is connected to one of said arms, a lower element having a foot support member at its lower end, and an intermediate pivotal connection whereby the upper and lower elements are connected to one-another.

In accordance with a further feature of the invention, the upper and lower elements of the leg supports are releasably and adjustably secured to the upper pivotal mounting, intermediate pivotal connection and foot support member, so that the effective length of each of said elements can be adjusted independently.

In a preferred arrangement, each of said elements comprises a bar and end portions thereof are connected in overlapping relationship with the upper pivotal mounting, the intermediate pivotal connection and the foot support member as appropriate, for example by means of clamping plates.

The upper pivotal mounting acts as a hip-joint and preferably incorporates means for adjustment of the abduction/

aduction angle at the joint. Such means, in accordance with a further feature of the invention, comprises a gimbals assembly including a block mounted for pivotal movement about a first generally horizontal axis and defining a second generally horizontal axis orthogonal thereto, a pivot pin centred on said second axis and carrying said upper pivotal mounting, and adjustment screws carried by said block and engaging with said upper pivotal mounting so as to enable the latter to be set in any of a plurality of positions of angular adjustment relative to a line orthogonal to the first and second axes.

In accordance with a further feature of the invention, the foot support means includes a shoe clamp carried by a pivotal joint with a restricted and adjustable range of pivotal movement to provide control over the degree of dorsiflexion and plantiflexion at the ankle of the user. This joint may comprise an upper arm which is connected to the lower element of the leg support, and lower arm which carries the shoe clamp, and a pivotal connection between said upper and lower arms, wherein the range of pivotal movement is limited and adjustable. The range of movement may be limited by pins which extend through overlapping arcuate slots formed in said arms and the effective length of overlap of said slots is adjustable. In an alternative arrangement, the range of movement permitted to the lower arm relative to the upper arm may be controlled by means of a stop block which is mounted on the upper arm and engages in a recess formed at the upper end of the lower arm to limit angular movement at the joint. The stop block may be adjustable in position relative to the upper arm, for example by being reversible through 180° and may have a wider end and a narrower end, either of which can be arranged to engage in the recess so as to provide for two different ranges of movement. It will be appreciated that it would be possible to provide other interchangeable stop blocks to afford different ranges of movement, of to provide a modified stop block with more than two end portions, e.g. three of four, by forming the block with three or four arms.

A further feature of the invention relates to the shoe clamp, which may comprise a mounting arm which is releasably connectable to said lower arm of said pivotal joint at the user's ankle, a support bar which extends transversely from said mounting arm, a bracket at a free end of said support bar adapted to engage over the welt of a shoe worn by the user, and an adjustable clamp carried by said mounting arm to engage on the welt of the user's shoe at the side thereof opposite said bracket.

A further form of shoe clamp in accordance with the invention comprises a mounting arm which is releasably connectable to said lower arm of said pivotal joint at the user's ankle, a support bar which extends transversely from said mounting arm, brackets at opposite ends of said support bar having flanges adapted to engage over the welt of a shoe worn by the user, and an adjustable member carried by said support bar for movement in a direction towards and away from said flanges to clamp against the underside of the user's shoe.

The invention further resides in a wheeled frame for carrying an orthosis **(60)** to provide a controlled walking facility when the orthosis is mounted on the frame, wherein the wheeled frame comprises a first frame member which extends generally in a direction transverse to the normal walking direction when in use and having thereon attachment means for releasably mounting a support member adapted to carry said orthosis and connection means for the releasable connection of lateral frame members at opposite ends of the first frame member.

The invention also resides in an orthosis for use with a wheeled frame and having a pair of leg supports each of which includes an upper element having a pivotal mounting at its upper end whereby it is connected to a back support, a lower element having a foot support member at its lower end, and an intermediate pivotal connection whereby the upper and lower elements are connected to one-another, wherein the upper and lower elements of the leg supports are releasably and adjustably secured to the upper pivotal mounting, to the intermediate pivotal connection and to the foot support member, so that the effective length of each of said elements can be adjusted independently.

BRIEF DESCRIPTION

These and other features of the invention will now be described by way of example with reference to the accompanying drawings wherein:

FIG. **1** shows one embodiment of wheeled frame with a number of alternative and interchangeable components,

FIG. **2** shows connections between a transverse member of the frame and lateral members of the frame, one such connection being shown in "exploded" form,

FIG. **3** shows, in "exploded" form an arrangement for imposing a variable restriction on the swivelling action of castor wheels provided at the forward end of the frame,

FIG. **4** shows an orthosis of the kind for assembly with the frame,

FIG. **5** shows, in "exploded" form of a hip-joint of a leg support forming part of the orthosis,

FIG. **6** shows an adjustable connection at the upper end of the leg support,

FIG. **7** shows a knee-joint of the leg support,

FIG. **8** shows an adjusting assembly which is used to determine the required length of upper and lower elements of the leg support,

FIG. **9** shows an adjustable connection at the lower end of the leg support and an ankle-joint,

FIG. **10** shows the ankle-joint in "exploded" form,

FIG. **11** shows an alternative form of ankle-joint,

FIG. **12** shows the alternative ankle-joint in "exploded" form,

FIG. **13** shows one form of foot support provided at the lower end of the leg support,

FIG. **14** shows an alternative form of foot support, and

FIG. **15** shows a combination of an orthosis and a wheeled frame.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. **1**, an orthotic walker in accordance with the invention comprises a wheeled frame **10** formed from a number of interconnectable and interchangeable frame members whereby the frame can be adapted readily to support users of differing weights and sizes. As illustrated, the frame **10** comprises a first frame member **11** which forms the rear part of the frame and extends generally transversely relative to the in-use direction of forward advancement. The rear frame member includes a tube **12** which has secured at the ends thereof respective discs **13**. Rearwardly and downwardly inclined arms **14** are secured: at the outer faces of the discs **13** by means of screws or other suitable fastening elements. At their lower ends, the arms **14** support a transversely extending axle **15** which carries a pair of rear wheels **16** at positions disposed outwardly of the arms **14**.

Centrally of its length, the tube **12** caries a mounting assembly **17** for a support member **20** which comprises an upright stem **21** which is adapted to be releasably secured to the mounting assembly **17** in any suitable manner. The upper end of the stem **21** curves forwardly and carries a vertically arranged linear suspension unit **22** having a vertically projecting rod **23** which is movable under the control of spring means (not shown).

The frame **10** further comprises a pair of lateral frame members **30**, each of which includes a transversely extending portion **31** and a forwardly extending portion **32**. The free end of the transversely extending portion **31** of each lateral frame member **30** carries a disc **33** formed with a pair of diametrically opposed key-hole slots **34** adapted to receive headed studs **19** carried by the assembly of disc **13** and arm **14** of the rear frame member **11** whereby the lateral frame members **30** are releasably secured to the rear frame member **11**.

It will be understood that because the arms **14** are directed rearwardly, the weight of the walker applies a turning moment at the upper ends of the arms, and the key-hole slots **34** are oppositely directed so that such turning moment acts to assist the retention of the studs **19** in the narrower ends of the slots **34**.

However, additionally, the disc **33** is formed with a further slot **35** for the reception of a clamping screw **36** to secure the discs **13** and **33** together securely.

At their forward ends, the lateral frame members **30** carry respective castor wheel assemblies **40**, each comprising a wheel **41** mounted for rotation on a pair of forks **42** with a vertical pivot pin **43** which defines a swivelling axis. The pivot pin **43** is located in a bearing sleeve **44** secured to the forward end of the forwardly extending portion **32** of the lateral frame member **30**. Whilst the wheels **42** may be freely swiveallable about the vertical axis defined by the pivot pins **43**, in accordance with a preferred feature of the invention means is provided to restrict such swivelling movement.

For this purpose, and as shown in FIG. **3**, the pivot pin **43** is formed at its upper end with a square spigot **45** on which a control disc **46** is located. In the illustrated embodiment, the control disc **46** is formed with four recesses **47***a*, **47***b*, **47***c* and **47***d* of differing peripheral lengths. A peg **48** is carried by the sleeve **44**, and the control disc **46** can be assembled with the spigot **46** in any of four different positions so that one of the four recesses receives the peg **48**. The recess **47***a* is so dimensioned as to prevent the disc **46** turning, thereby holding the forks **42** in a fixed position, whereas recesses **47***b*, **47***c* and **47***d* allow progressively increasing ranges of swivelling movement.

The frame **10** preferably also includes a removable cross-member **50** which can be secured between the lateral frame members **30** at a position adjacent the forward ends thereof. For this purpose, the cross-member **50** is provided with clamps **51** which are adapted to grip the tubular forwardly extending portions **32** of the lateral frame members.

The cross-member **50** may carry a pair of rollers **52** for guide straps associated with leg supports included in the orthosis as hereinafter described, and one or more further rollers, for example as shown at **18** in FIG. **1**, may be provided on the rear frame member **11** for the same purpose.

In order to construct several different sizes of wheeled frame, additional lateral side members, such as shown at **30**A are provided, and these may be interchanged with the lateral frame members **30** by virtue of the releasable connection afforded by the headed studs **19** carried by the first frame member **11**. As illustrated, the alternative lateral frame members **30**A include transversely extending portions **31***a* and forwardly extending portions **32***a* which are shorter than the corresponding portions of the lateral frame members **30**. In a similar manner, further lateral frame members of increased or reduced dimensions may be provided. Similarly, further cross-members, such as the cross-member **50**A may be provided, with lengths appropriate to the spacing between the different sets of lateral frame members. Alternatively, the cross-member **50** may itself be constructed so as to be adjustable in length.

Likewise, an alternative support member **20**A may be provided, having a stem **21***a* which is shorter or longer than the stem **21** of the support member **20**, and with a suspension unit **22***a* having a different range of travel and/or different spring characteristics.

Whilst the embodiment illustrated has the rear wheels **16** carried by the rear frame member **11**, it will be appreciated that it would alternatively be possible for the rear wheels to be carried in a similar manner by the lateral frame members **30** in a similar position. In further variations, the rear frame member may be wider than illustrated, and the lateral frame members could then simply extend forwardly, instead of having transversely extending portions, and such modified lateral frame members could then be connected releasably to the rear frame members in the same manner as the cross-member is connected to the lateral frame members.

The walker further comprises an orthosis **60** which, in the embodiment illustrated in FIGS. **4** to **12**, includes a back member **61** which extends transversely and centrally thereof has pivotally connected thereto a mounting member **62** which includes a downwardly directed hollow spigot **63** so dimensioned as to fit over the upper end of the rod **23** of the suspension unit **20** so that after the orthosis is fitted to the user, the user and the orthosis can be lifted into the frame to locate the spigot **63** onto the rod **23**.

At each end the back member **61** carries adjustably secured thereto respective lateral arms **64** which curve forwardly and carry at their forward ends pivotal mountings **65** for leg support assemblies **70**.

Each leg support assembly **70** comprises an upper, hip-joint member **71**, an intermediate, knee-joint member **72** and a lower, ankle-joint member **73**, interconnected by upper and lower leg bars **74** and **75**.

The hip-joint member **71** swings freely on a pivot pin **76** which is carried by a gimbals assembly comprising a gimbals block **66** which is mounted on pivot pins **67** in the mounting **65** for movement about a forwardly extending horizontal axis.

Adjuster pins **68** enter threaded bores **69** in the gimbals block **66** and at their outer ends bear against the inwardly presented side face of the hip joint member **71** so as to provide for variation of the abduction/aduction angle of the joint.

The hip-joint member **71** is formed with a longitudinally extending groove **77** which slidably receives the upper end portion of the upper leg bar **74**, and has an associated clamping plate **78** whereby the leg bar **74** may be secured to the hip-joint member **71** in a range of positions of longitudinal adjustment relative to the axis defined by pivot pin **76**.

Whilst the leg bars may be of square-shape in transverse section, in the illustrated embodiment they are of circular section with a flat, outwardly presented face **79** which co-operates with the flat clamping plate **78**, and the groove **77** is correspondingly of part-circular form in section.

The knee-joint **72** comprises pivotally connected arms **80**,**81** which carry at their outermost ends clamping blocks

82,83 to receive respectively the lower end of the upper leg bar **74** and the upper end of the lower leg bar **75** in a longitudinally adjustable manner.

The ankle-joint **73** likewise includes an upper arm **84** which carries a clamping block **85** whereby it is adjustably secured to the lower end of the lower leg bar **75**.

In this way, the distance between the pivotal axes of the hip, knee and ankle-joints can be adjusted individually to suit specific users, both when they are initially fitted with the orthosis, and also to accommodate any subsequent growth. The leg bars **74,75** can be cut to any required length from stock material, and the adjustment available at each end of each leg bar can be in the region of 5 cm so that, using the same set of leg bars, a total length adjustment up to about 20 cm can be achieved for the entire leg support.

In order to determine precisely the required length of the leg bars **74,75**, an adjuster assembly **86**, as shown in FIG. **8**, ay be used. This comprises a link **87** having at each end a respective clamping block **88** for the reception of a respective rod **89**, which may comprise material the same as that from which the leg bars are cut. In use, the required spacing between the users hip and knee-joint, or between the user's knee and ankle-joint can be determined by adjusting the rods **89** relative to the link **87** against the user's body, and then cutting a length of the leg bar material to the required dimension to serve as the upper leg bar **74** or lower leg bar **75** as appropriate.

The ankle-joint member **73** also includes a lower arm **89** which is pivotally connected to the upper arm **84** by means of a pivot pin **90**.

The angular range of movement of the lower arm **89** relative to the upper arm **84** is adjustable by virtue of pairs of arcuate slots **91** formed in a lower end portion of the upper arm **84** and arcuate slots **92** formed in an upper end portion of the lower arm **89**, the slots being centred on the axis of the pivot pin **90**.

The pivot pin **90** is carried by an end plate **93** which is secured by means of headed screws **94** to a further end plate **95** with the interposition of a spacer plate **96**, and the end portions of the arms **84,89** are disposed between the plates **93,95,96** as shown in FIG. **10**. The shanks of the headed screws **94** pass through the arcuate slots **91** and **92** in the end portions of the arms, and the upper and lower arms **84,89** can be secured together in a range of angular positions by slackening off the screws **94**, and adjusting the lower arm **89** angularly relative to the upper arm **84** before re-tightening the screws **94**.

The alternative form of ankle joint member **73A** as shown in FIGS. **11** and **12** is of generally similar construction and similar parts are designated by the same reference numerals. However, in this case the range of movement permitted to the lower arm **89** relative to the upper arm **84** is controlled by means of a stop block **91***a* which is mounted on the upper arm **84** and engages in a recess **92***a* formed at the upper end of the lower arm **89** to limit angular movement at the joint. The stop block **91***a* is reversible through 180° and has a wider end and a narrower end, either of which can be arranged to engage in the recess **92***a* so as to provide for two different ranges of movement. It will be appreciated that it would be possible to provide other interchangeable stop blocks to afford different ranges of movement, of to provide a modified stop block with more than two end portions, e.g. three of four, by forming the block with three or four arms.

The lower arm **89** of the ankle joint member **73** or **73A** carries a shoe clamp assembly **100** which is releasably connectable thereto. The shoe clamp assembly **100** comprises a mounting arm **101** have at its lower end a transversely extending support bar **102**, and the latter at its free end carries a bracket **103** having an inwardly directed flange **104** which is adapted to engage over the upper edge of the welt of a user's shoe when the shoe rests on the support bar **102**. The mounting arm **101** also carries a vertically adjustable clamping member **105** to engage the welt of the user's shoe at the side thereof opposite the bracket **103**. Different sizes of bracket may be provided for interchangeable assembly with the support bar **102** to accommodate differing thickness of welt.

An alternative form of shoe clamp assembly as shown in FIG. **12** utilises a second bracket **106** with an inturned flange **107** in place of the adjustable clamping member **105**, and in this case the support bar **102** carries a clamping plate **108** which is adjustable in a direction towards and away from the flanges **104,107** and is adapted to bear against the underside of the user's shoe, so as to draw the flanges **104,107** onto the welt on both sides of the shoe. Again interchangeable brackets of differing sizes may be provided for assembly with the support bar **102** as required.

FIG. **15** shows an example of a combination of the orthosis and the wheeled frame.

It will be understood that the orthosis **60** as illustrated and described above may be modified as necessary for individual patients, and may additionally include means for supporting the user's upper body and/or arms and/or head.

What is claimed is:

1. An orthotic walker comprising an orthosis **(60)** mounted on a wheeled frame **(10)**, wherein the wheeled frame **(10)** comprises a first frame member **(11)** which extends generally in a direction transverse to the normal walking direction when in use and having thereon attachment means **(17)** for releasably mounting a support member **(20)** adapted to carry said orthosis **(60)** and connection means **(13, 33)** for the detachable connection of lateral frame members **(30)** at opposite ends of the first frame member **(11)** to permit the walker to be adapted to the requirements of a patient,

wherein a plurality of interchangeable lateral frame members **(30, 30A)** are provided and each of the lateral frame members **(30, 30A)** includes a transverse part **(31, 31*a*)** whereby the lateral frame member is connected to the first frame member **(11)** and a forwardly extending part **(32, 32*a*)** whereby the overall width of the frame **(10)** can be varied by selecting lateral frame members **(32, 32A)** having a transverse part of differing length.

2. An orthotic walker according to claim **1**,

wherein the first frame member **(11)** carries a pair of laterally spaced wheels **(16)** and said connection means **(13,33)** are disposed outwardly thereof.

3. An orthotic walker according to claim **2** wherein the lateral frame members **(30)** each carry a further wheel **(41)** at or adjacent to the end thereof remote from said connection means **(13,33)**.

4. An orthotic walker according to claim **3** wherein said further wheels **(41)** are castor wheels adapted to swivel about an upright axis.

5. An orthotic walker according to claim **4** wherein the wheels **(16)** carried by the first frame member **(11)** are non-swivelling.

6. An orthotic walker according to claim **3** wherein adjustable means **(45–48)** are provided for restricting the degree of swivelling allowed said castor wheels **(41)**.

7. An orthotic walker according to claim **2** wherein the connection means **(13,33)** for the lateral frame members **(30)**

comprises two or more headed studs (**19**) which project in the transverse direction at each end of the first frame member (**11**) at equal angular spacings about a transversely extending axis of rotation, and each of said lateral frame members (**30**) includes a mounting plate (**33**) having a number of key-hole slots (**34**) corresponding to said studs (**19**), whereby wider end portions of said key-hole slots (**34**) can be passed over the respective studs (**19**) and the mounting plate (**33**) rotated to engage said studs in narrower end portions of said slots.

8. An orthotic walker according to claim **7** wherein the wheels (**16**) carried by the first frame member (**11**) are carried at the outer ends of respective arms (**14**) at positions spaced from the first frame member (**11**) in a direction perpendicular to the transverse direction so that when the wheels (**16**) are engaged with the floor to support the walker a turning moment is applied to the arms (**14**), and the arrangement is such that the turning moment acts to assist retention of the studs (**19**) in the narrower ends of the slots (**34**).

9. An orthotic walker according to claim **8** wherein a locking fastener is additionally provided to hold the mounting plate (**33**) in assembled relation with the first frame member (**11**).

10. An orthotic walker according to claim **1** wherein the lateral frame members (**30**) each carry a respective wheel at or adjacent to the end thereof at which it is connected to the first frame member (**11**), in addition to, or instead of, the laterally spaced wheels (**16**) carried by the first frame member (**11**).

11. An orthotic walker according to claim **1** wherein the wheeled frame (**10**) additionally includes a further transversely extending frame member (**50**) which is releasably connectable to said lateral frame members (**30**) at or near the ends thereof remote from their connection with said first frame member (**11**).

12. An orthotic walker according to claim **1** wherein said lateral frame members (**30, 30**A) are integrally interconnected by a transverse frame member at the ends thereof remote from said first frame member (**11**).

13. An orthotic walker according to claim **1** wherein the support member (**20**) which carries the orthosis (**60**) is one of a plurality of such support members (**20**,**20**A) provided in a range of sizes to suit patients of differing height and weight.

14. An orthotic walker according to claim **13** wherein the support member (**20**,**20**A) includes a linear suspension unit (**22**,**22***a*) carried at the upper end of a generally upright arm (**21**,**21***a*).

15. An orthotic walker according to claim **14** wherein the suspension unit (**22**) comprises a rod (**23**) guided for movement in a generally vertical direction under the control of a spring, and the orthosis (**60**) is releasably connectable to said rod (**23**).

16. An orthotic walker according to claim **1** wherein the orthosis (**60**) comprises a back member (**61**) having a mounting means (**62**,**63**) thereon whereby it is releasably connectable to said rod (**23**) of the suspension unit (**20**,**20**A).

17. An orthotic walker according to claim **16** wherein the mounting means (**62**,**63**) includes a tubular fitting (**63**) adapted to be engaged slidably over an end portion of said rod (**23**).

18. An orthotic walker according to claim **16** wherein the mounting means (**62**,**63**) is pivotally secured to said back member (**61**) so as to allow the latter to tilt about a generally horizontal axis.

19. An orthotic walker according to claim **16** wherein the back member (**61**) carries a pair of lateral arms (**64**) mounted adjustably thereon, and each said arm (**64**) includes a transversely extending portion, a forwardly extending portion, and at the forward end thereof a pivotal mounting (**65**) by means of which a respective leg support (**70**) is suspended.

20. An orthotic walker according to claim **19** wherein said leg supports (**70**) each comprise an upper element (**74**) having a pivotal mounting (**71**) at its upper end whereby it is connected to one of said lateral arms (**64**), a lower element (**75**) having a foot support member (**100**) at its lower end, and an intermediate pivotal connection (**72**) whereby the upper and lower elements are connected to one-another.

21. An orthotic walker according to claim **20** wherein the upper and lower elements (**74**,**75**) of the leg supports (**70**) are releasably and adjustably secured to the upper pivotal mounting (**71**), to the intermediate pivotal connection (**72**) and to the foot support member (**100**), so that the effective length of each of said elements can be adjusted independently.

22. An orthotic walker according to claim **21** wherein each of said upper and lower elements (**74**,**75**) comprises a bar and end portions thereof are connected in overlapping relationship with the upper pivotal mounting (**71**), the intermediate pivotal connection (**72**) and the foot support member (**100**) as appropriate.

23. An orthotic walker according to claim **22** wherein said bars include a flat face (**79**) at opposed ends thereof arranged to co-operate with clamping means provided on each of the upper pivotal mounting (**65**), the intermediate pivotal connection (**72**) and the foot support member (**100**) as appropriate.

24. An orthotic walker according to claim **19** wherein the upper pivotal mounting (**65**) which acts as a hip-joint incorporates means (**66–71**) for adjustment of the abduction/aduction angle at the joint.

25. An orthotic walker according to claim **24** wherein said abduction/subduction angle adjustment means comprises a gimbals assembly including a block (**66**) mounted for pivotal movement about a first generally horizontal axis and defining a second generally horizontal axis orthogonal thereto, a pivot pin (**76**) centred on said second axis and carrying said upper pivotal mounting (**71**), and adjuster screws (**68**) carried by said block (**66**) and engaging with said upper pivotal mounting (**71**) so as to enable the latter to be set in any of a plurality of positions of angular adjustment relative to a line orthogonal to the first and second axes.

26. An orthotic walker according to claim **19** wherein the foot support member (**100**) includes a shoe clamp (**103**, **105**;**103**,**107**) carried by a pivotal ankle joint (**73**) with a restricted and adjustable range of pivotal movement to provide control over the degree of dorsiflexion and plantiflexion at the ankle of the user.

27. An orthotic walker according to claim **26** wherein the ankle joint (**73**) comprises an upper arm (**84**) which is connected to the lower element (**75**) of the leg support (**70**), and a lower arm (**89**) which carries the foot support means (**100**), and a pivotal connection (**73**) between said upper and lower arms, wherein the range of pivotal movement is limited and adjustable.

28. An orthotic walker according to claim **27** wherein said range of pivotal movement of the ankle joint (**73**) is limited by pins (**94**) which extend through overlapping arcuate slots (**91**,**92**) formed in said upper and lower arms (**84**,**89**) and the effective length of overlap of said slots (**91**,**92**) is adjustable.

29. An orthotic walker according to claim **27** wherein said range of pivotal movement of the ankle joint (**73**A) is limited by means of a stop block (**91***a*) which is mounted on the

upper arm (**84**) and engages in a recess (**92***a*) formed at the upper end of the lower arm (**89**) to limit angular movement at the joint.

30. An orthotic walker according to claim **29** wherein the stop block (**91***a*) is reversible through 180° and has a wider end and a narrower end, either of which can be arranged to engage in the recess (**92***a*) so as to provide for two different ranges of movement.

31. An orthotic walker according to claim **30** wherein the stop block (**91***a*) is one of a plurality of interchangeable stop blocks to afford different ranges of movement.

32. An orthotic walker according to claim **26** wherein the shoe clamp comprises a mounting arm (**101**) which is releasably connectable to said lower arm (**89**) of said pivotal ankle joint (**73**), a support bar (**102**) which extends transversely from said mounting arm (**101**), a bracket (**103**) at a free end of said support bar (**102**) adapted to engage over the welt of a shoe worn by the user, and an adjustable clamp (**105**) carried by said mounting arm (**101**) to engage on the welt of the user's shoe at the side thereof opposite said bracket (**103**).

33. An orthotic walker according to claim **26** wherein the shoe clamp comprises a mounting arm (**101**) which is releasably connectable to said lower arm (**89**) of said pivotal ankle joint (**73**), a support bar (**102**) which extends transversely from said mounting arm (**101**), brackets (**103,106**) at opposite ends of said support bar (**102**) having respective flanges (**104,107**) adapted to engage over the welt of a shoe worn by the user, and an adjustable member (**108**) carried by support bar (**102**) for movement in a direction towards and away from said flanges (**103,107**) to clamp against the underside of the user's shoe.

34. A wheeled frame (**10**) for carrying an orthosis (**60**) to provide a controlled walking facility when the orthosis is mounted on the frame, wherein the wheeled frame (**10**) comprises a first frame member (**11**) which extends generally in a direction transverse to the normal walking direction when in use and having thereon attachment means (**17**) for releasably mounting a support member (**20**) adapted to carry said orthosis (**60**) and connection means (**13, 33**) for the detachable connection of lateral frame members (**30**) at opposite ends of the first frame member (**11**) to permit the walker to be adapted to the requirements of a patient,

wherein a plurality of interchangeable lateral frame members (**30, 30**A) are provided and each of the lateral frame members (**30, 30**A) includes a transverse part (**31, 31***a*) whereby the lateral frame member is connected to the first frame member (**11**) and a forwardly extending part (**32, 32***a*) whereby the overall width of the frame (**10**) can be varied by selecting lateral frame members (**32, 32**A) having a transverse part of differing length.

35. A wheeled frame according to claim **34** which additionally includes a further transversely extending frame member (**50**) which is releasably connectable to said lateral frame members (**30**) at or near the ends thereof remote from their connection with said first frame member (**11**).

36. A wheeled frame according to claim **34** wherein the support member (**20**) which carries the orthosis (**60**) is one of a plurality of such support members (**20,20**A) provided in a range of sizes to suit patients of differing height and weight.

37. An orthosis for use with a wheeled frame according to claim **34** and having a pair of leg supports (**70**) each of which includes an upper element (**74**) having a pivotal mounting (**71**) at its upper end whereby it is connected to a back support, a lower element (**75**) having a foot support member (**100**) at its lower end, and an intermediate pivotal connection (**72**) whereby the upper and lower elements are connected to one-another, wherein the upper and lower elements (**74,75**) of the leg supports (**70**) are releasably and adjustably secured to the upper pivotal mounting (**76**), to the intermediate pivotal connection (**72**) and to the foot support member (**100**), so that the effective length of each of said elements can be adjusted independently.

38. An orthosis according to claim **37** wherein each of said upper and lower elements (**74,75**) comprises a bar and end portions thereof are connected in overlapping relationship with the upper pivotal mounting (**71**), the intermediate pivotal connection (**72**) and the foot support member (**100**) as appropriate.

39. An orthosis according to claim **38** wherein the foot support member (**100**) includes a shoe clamp (**103,105;103, 107**) carried by a pivotal ankle joint (**73**) with a restricted and adjustable range of pivotal movement to provide control over the degree of dorsiflexion and plantiflexion at the ankle of the user.

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